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contact with that part of the aurora towards the east. When the aurora commenced, the moon was considerably below the horizon; but this, it is considered, does not form any serious objection to what has been stated, since the aurora soared to so great a height, that the rays of light proceeding from her would strike the aurora a considerable time before she arose above the horizon.

The aurora continued for upwards of six hours, and during that time the thermometer stood at 34°.

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January 18, 1849.

The MARQUIS OF NORTHAMPTON, V.P., in the Chair.

A paper was read, entitled "On the Development and Homologies of the Carapace and Plastron of the Chelonian Reptiles." By Professor Owen, F.R.S.

The author commences by defining the several parts of which the osseous thoracic-abdominal case of the Chelonian Reptiles is composed, and briefly discusses the several opinions that have been published with regard to their nature and homologies, dwelling chiefly on that recently proposed by Prof. Rathké, in his work on the Development of the *Chelonia*, in which it is contended that the carapace consists exclusively of the development of parts of the endo-skeleton, viz. the neural spines and vertebral ribs (*pleurapophyses*), agreeably with the opinion of CUVIER and BOJANUS, and that the remainder of the thoracic-abdominal case, consisting of the "marginal pieces" and "plastron," are formed entirely from bones of the dermal system.

Adverting to the hypotheses of Cuvier, Geoffroy and Meckel, that the thoracic-abdominal case is a modification of parts of the endo-skeleton exclusively, the author tests their determinations by comparisons with the corresponding parts of the bird and crocodile, and infers, from the latter animal, that the hyosternal, hyposternal and xiphisternal bones are not parts of the sternum, but are homologous with the hæmapophyses (sternal ribs and abdominal ribs); those in the *Plesiosaurus* making the nearest approach to the peculiar development of the parts in the *Chelonia*, especially as they appear in the plastron of the immature Terrapenes and Sea-turtles.

Admitting that any hypothesis framed from the comparison of the completed structures in the adult Vertebrata requires for confirmation its agreement with the important phenomena of the development of those structures, the author proceeds to apply that test.

He details his observations on the development of the skeleton, and especially of the thoracic-abdominal case, in the embryos and young of different genera of *Chelonia*. The chief facts that have governed his conclusions are the following:—

With respect to the carapace. The cartilaginous basis of the neural plates is developed in the substance of the derm; and of

these, the 9th, 10th, 11th, and the 'nuchal' plate are ossified from independent centres, and remain permanently free from anchylosis with the subjacent spines of the vertebræ: they are, therefore, "dermal bones," homologous with those that overlies the vertebræ of the crocodile. But the first to the eighth neural plates inclusive are serial homologues with the foregoing, and must, therefore, have the same general homology. The objection that ossification extends into their dermal cartilaginous basis from the neural spines is met by the remark, that other parts, *e.g.* the radius and ulna of the frog, are ossified from a common centre, without their homological distinctness being thereby masked or destroyed. The course or starting-point of ossification does not determine the nature and homology of parts, and the author refers what he believes to be an erroneous conclusion of Prof. Rathké to undue value being given to the character of connation.

The cartilaginous basis of the costal plates is developed in the substance of the derm; the subjacent ribs are previously ossified and present the normal slender form. But ossification extends from near the head of each of the eight pairs of dorsal ribs, from the second to the ninth pair inclusive, into the superincumbent dermal cartilages. This had been described as the development of the tubercle of the rib. But Prof. Owen observes that, in the development of the carapace of the young of the *Testudo indica*, the connation of the costal plate with the rib commences at a different point in each rib alternately, and appears to be governed by the arrangement of the horny scutes above. Another objection to these ossific expansions being the tubercles of the ribs is presented by their abutment mesially against the neural plates, not against the vertebral diapophyses, as in the bird and crocodile.

In regard to the development of the plastron, the author describes two situations in which the primitive cartilages are developed, corresponding with those in the embryo-carapace, viz. one belonging to the endo-skeleton, the other in the derm. The first form under which the endo-skeletal parts of the plastron appear agrees with the evidence afforded by the comparison of the fully-developed parts with those of the crocodile, and proves the hyosternals, hyposternals and xiphisternals to be 'hæmapophyses' or abdominal ribs: the hyosternals and hyposternals are primitively long, slender, transverse bars, which join the vertebral ribs in the Tortoises and Terrapenes, without the intervention of any marginal pieces. The ossification of the superadded dermal portions proceeds from the previously ossified endo-skeletal elements.

The author concurs with M. Rathké in regarding the marginal pieces as 'dermal bones,' and concludes by a full discussion of the facts and arguments which have led him to a different conclusion respecting the nature and homologies of the carapace and plastron.

The memoir is illustrated by figures of the carapace and plastron, and of the corresponding segments of the skeleton in the bird and crocodile, and of the development of the thoracic-abdominal case in land- and sea-chelonians.